ME 8: Containerization and Docker

Exercise 6: Networking

Tingcap B. Mortaba II

2018-10514

I. Listing networks

```
C:\Users\tingc>docker network ls
NETWORK ID     NAME      DRIVER    SCOPE
805830716afc   bridge    bridge    local
014de73b24af   host      host      local
e15f7a0e80c0   none      null      local
```

II. The default 'bridge' network

```
C:\Users\tingc>docker network inspect bridge
[
    {
        "Name": "bridge",
        "Id": "805830716afca07f6e591b530ec243caedb52c93e337cb7a55022fb2c8c2aca7",
        "Created": "2021-06-11T21:38:26.1766741Z",
        "Scope": "local",
        "Driver": "bridge",
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": null,
            "Config": [
                {
                    "Subnet": "172.17.0.0/16"
                }
            ]
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {},
        "Options": {
            "com.docker.network.bridge.default_bridge": "true",
            "com.docker.network.bridge.enable_icc": "true",
            "com.docker.network.bridge.enable_ip_masquerade": "true",
            "com.docker.network.bridge.host_binding_ipv4": "0.0.0.0",
            "com.docker.network.bridge.name": "docker0",
            "com.docker.network.driver.mtu": "1500"
        },
        "Labels": {}
    }
]
```

```
C:\Users\tingc>docker run --rm -d --name dummy tbmortaba/ping:1.0
fa7d7d48e50696ed3679132dc68197663197a57892df61a49cd8b43ef5b99454

C:\Users\tingc>docker network inspect bridge
[
    {
        "Name": "bridge",
        "Id": "805830716afca07f6e591b530ec243caedb52c93e337cb7a55022fb2c8c2aca7",
        "Created": "2021-06-11T21:38:26.1766741Z",
        "Scope": "local",
        "Driver": "bridge",
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": null,
            "Config": [
                {
                    "Subnet": "172.17.0.0/16"
                }
            ]
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {
            "fa7d7d48e50696ed3679132dc68197663197a57892df61a49cd8b43ef5b99454": {
                "Name": "dummy",
                "EndpointID": "2b492fd1d5e7d7690d188a8e22424c30d3a6b9e3c8d4967fbb7a08deeb43548a",
                "MacAddress": "02:42:ac:11:00:02",
                "IPv4Address": "172.17.0.2/16",
                "IPv6Address": ""
            }
        },
        "Options": {
            "com.docker.network.bridge.default_bridge": "true",
            "com.docker.network.bridge.enable_icc": "true",
            "com.docker.network.bridge.enable_ip_masquerade": "true",
            "com.docker.network.bridge.host_binding_ipv4": "0.0.0.0",
            "com.docker.network.bridge.name": "docker0",
            "com.docker.network.driver.mtu": "1500"
        },
        "Labels": {}
    }
]
```

```
C:\Users\tingc>docker run --rm -d -e PING_TARGET=172.17.0.2 --name pinger tbmortaba/ping:1.0
eba35aa9269cd8c44882c5c4488b926ed287aee27c4dffa1ac6e23e2d3bce31a

C:\Users\tingc>docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED         STATUS         PORTS     NAMES
eba35aa9269c   tbmortaba/ping:1.0   "sh -c 'ping $PING_T…"   9 seconds ago   Up 6 seconds             pinger
fa7d7d48e506   tbmortaba/ping:1.0   "sh -c 'ping $PING_T…"   2 minutes ago   Up 2 minutes             dummy

C:\Users\tingc>docker logs pinger
PING 172.17.0.2 (172.17.0.2) 56(84) bytes of data.
64 bytes from 172.17.0.2: icmp_seq=1 ttl=64 time=0.069 ms
64 bytes from 172.17.0.2: icmp_seq=2 ttl=64 time=0.036 ms
64 bytes from 172.17.0.2: icmp_seq=3 ttl=64 time=0.035 ms
64 bytes from 172.17.0.2: icmp_seq=4 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=5 ttl=64 time=0.036 ms
64 bytes from 172.17.0.2: icmp_seq=6 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=7 ttl=64 time=0.036 ms
64 bytes from 172.17.0.2: icmp_seq=8 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=9 ttl=64 time=0.037 ms
64 bytes from 172.17.0.2: icmp_seq=10 ttl=64 time=0.036 ms
64 bytes from 172.17.0.2: icmp_seq=11 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=12 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=13 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=14 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=15 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=16 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=17 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=18 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=19 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=20 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=21 ttl=64 time=0.035 ms
64 bytes from 172.17.0.2: icmp_seq=22 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=23 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=24 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=25 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=26 ttl=64 time=0.035 ms
64 bytes from 172.17.0.2: icmp_seq=27 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=28 ttl=64 time=0.033 ms
64 bytes from 172.17.0.2: icmp_seq=29 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=30 ttl=64 time=0.057 ms
64 bytes from 172.17.0.2: icmp_seq=31 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=32 ttl=64 time=0.038 ms
64 bytes from 172.17.0.2: icmp_seq=33 ttl=64 time=0.034 ms
64 bytes from 172.17.0.2: icmp_seq=34 ttl=64 time=0.031 ms
64 bytes from 172.17.0.2: icmp_seq=35 ttl=64 time=0.034 ms
```

```
C:\Users\tingc>docker run --rm -d -e PING_TARGET=dummy --name pinger tbmortaba/ping:1.0
a90a6eaf1bb16a983241a452740bf47814aba7abad6d391570cb0a51e0ccc524

C:\Users\tingc>docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED         STATUS         PORTS     NAMES
fa7d7d48e506   tbmortaba/ping:1.0   "sh -c 'ping $PING_T…"   4 minutes ago   Up 4 minutes             dummy
```

III. Managing custom networks

```
C:\Users\tingc>docker network create skynet
31ee98c4be1462143d6c3f1f30ded5129bd4be9df4ccb67df561b61180ca2a28

C:\Users\tingc>docker network ls
NETWORK ID     NAME      DRIVER    SCOPE
805830716afc   bridge    bridge    local
014de73b24af   host      host      local
e15f7a0e80c0   none      null      local
31ee98c4be14   skynet    bridge    local

C:\Users\tingc>docker network inspect skynet
[
    {
        "Name": "skynet",
        "Id": "31ee98c4be1462143d6c3f1f30ded5129bd4be9df4ccb67df561b61180ca2a28",
        "Created": "2021-06-12T06:44:07.7636012Z",
        "Scope": "local",
        "Driver": "bridge",
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": {},
            "Config": [
                {
                    "Subnet": "172.19.0.0/16",
                    "Gateway": "172.19.0.1"
                }
            ]
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {},
        "Options": {},
        "Labels": {}
    }
]
```

IV. Adding containers to a network

```
C:\Users\tingc>docker run --rm -d --network skynet --name dummy tbmortaba/ping:1.0
7cb00456947c61da7928bae73a848c9e2ccf5dc6c54e1450eec0417e10b0f3d6

C:\Users\tingc>docker network inspect skynet
[
    {
        "Name": "skynet",
        "Id": "31ee98c4be1462143d6c3f1f30ded5129bd4be9df4ccb67df561b61180ca2a28",
        "Created": "2021-06-12T06:44:07.7636012Z",
        "Scope": "local",
        "Driver": "bridge",
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": {},
            "Config": [
                {
                    "Subnet": "172.19.0.0/16",
                    "Gateway": "172.19.0.1"
                }
            ]
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {
            "7cb00456947c61da7928bae73a848c9e2ccf5dc6c54e1450eec0417e10b0f3d6": {
                "Name": "dummy",
                "EndpointID": "fdf3da5ac8583150f2933f563e74e84bd832cf77c77c82e60f0c3b5c221ac16b",
                "MacAddress": "02:42:ac:13:00:02",
                "IPv4Address": "172.19.0.2/16",
                "IPv6Address": ""
            }
        },
        "Options": {},
        "Labels": {}
    }
]

C:\Users\tingc>docker run --rm -d --network skynet -e PING_TARGET=dummy --name pinger tbmortaba/ping:1.0
e65e9c392e59bb57d94fab6bc90ee45d179aeb230b4c83420c831189d8b7abec

C:\Users\tingc>docker logs pinger
PING dummy (172.19.0.2) 56(84) bytes of data.
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=1 ttl=64 time=0.061 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=2 ttl=64 time=0.039 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=3 ttl=64 time=0.041 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=4 ttl=64 time=0.039 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=5 ttl=64 time=0.036 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=6 ttl=64 time=0.039 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=7 ttl=64 time=0.073 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=8 ttl=64 time=0.037 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=9 ttl=64 time=0.037 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=10 ttl=64 time=0.037 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=11 ttl=64 time=0.037 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=12 ttl=64 time=0.037 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=13 ttl=64 time=0.036 ms
64 bytes from dummy.skynet (172.19.0.2): icmp_seq=14 ttl=64 time=0.036 ms
```

V. Connecting between containers in a network

```
C:\Users\tingc>docker run --rm --name widgetdb -e POSTGRES_PASSWORD=password -d --network skynet -p 5432 postgres
0587044c48f083862b61388500ed54482ac71806239edd5dca78f1cf8ada1878

C:\Users\tingc>docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED          STATUS         PORTS                     NAMES
0587044c48f0   postgres   "docker-entrypoint.s…"   10 seconds ago   Up 6 seconds   0.0.0.0:51935->5432/tcp   widgetdb
C:\Users\tingc>docker run --rm --name gadgetdb -e POSTGRES_PASSWORD=password -d --network skynet -p 5432 postgres
98ee017debca34f1def2544900e21f1a897b18c7703b13ec65c4bfc800b33024

C:\Users\tingc>docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED          STATUS          PORTS                     NAMES
98ee017debca   postgres   "docker-entrypoint.s…"   8 seconds ago    Up 5 seconds    0.0.0.0:51937->5432/tcp   gadgetdb
0587044c48f0   postgres   "docker-entrypoint.s…"   30 seconds ago   Up 25 seconds   0.0.0.0:51935->5432/tcp   widgetdb

C:\Users\tingc>docker exec -it widgetdb /bin/bash
root@0587044c48f0:/# psql -U postgres
psql (13.3 (Debian 13.3-1.pgdg100+1))
Type "help" for help.

postgres=# \q
root@0587044c48f0:/# psql -U postgres -h gadgetdb
Password for user postgres:
psql (13.3 (Debian 13.3-1.pgdg100+1))
Type "help" for help.

postgres=# \q
root@0587044c48f0:/# exit
exit

C:\Users\tingc>docker stop widgetdb
widgetdb

C:\Users\tingc>docker stop gadgetdb
gadgetdb
```

VI. Binding ports to a host

```
C:\Users\tingc>docker run --rm --name gadgetdb -e POSTGRES_PASSWORD=password -d --network skynet -p 5432:5432 postgres
d47a501a2b18ca50560ad53f226a2d0b538823937a1c39c2b7eb70f5de0f9a5a

C:\Users\tingc>psql -U postgres -h localhost
'psql' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\tingc>docker stop widgetdb
Error response from daemon: No such container: widgetdb

C:\Users\tingc>docker stop gadgetdb
gadgetdb
```